

EXECUTIVE OFFICE OF THE PRESIDENT
COUNCIL ON ENVIRONMENTAL QUALITY

722 JACKSON PLACE, N. W.

STATINTL

WASHINGTON, D. C. 20006

February 21, 1974

To: EPA: Mr. Richard E. Harrington

From: Jack Perry JP

Re: Protocol from Symposium on Particulate Control

This looks to have been a most interesting symposium. It was particularly good to see such broad participation from private industry. I am circulating the Protocol to a number of participants in our program.

May I make two comments. First, without being chauvinistic, I urge you to insure that future documents cite the U.S.-U.S.S.R. Environmental Agreement of May 23, 1972. To the uninformed, it will not be clear under what program the Symposium met.

Second, and a point you are already well aware of, we excel at putting on a good informative program for our visitors, and this looks to have been unusually good. Now we must be on the watch that the Soviet side puts on an equally good show for us next go-round.

By and large, I must congratulate you on an impressive effort. The project looks as if it is going along very well, I must say.

cc: EPA: Mr. Train, Mr. Green, Mr. Strother
State: Mr. Pardon(2), Mr. Kulick, Mr. Ganley
Amembassy Moscow: Dr. Tech
US Project Chairmen

STATINTL

Environment - Stationary Source Air
Pollution Control Technology

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PROTOCOL

Record of the First Joint US-USSR

Symposium on Particulate Control

In accordance with the protocol signed by the US-USSR Working Group on Stationary Source Air Pollution Control Technology signed in Moscow on March 29, 1973, a symposium and additional meetings between experts on particulate control were held in the United States between January 13-23, 1973. The objective was to exchange information needed to implement cooperation in development of improved methods for control of particulate air pollution.

The U.S. group was headed by Mr. Paul W. Spaite, Private Consultant. The Soviet group was headed by Dr. Georgy Lebedyuk of the State Research Institute of Industrial & Sanitary Gas Cleaning. A list of participants in each meeting is given in Appendix I, along with the meeting locations in the United States.

At the first meeting between the groups in Washington D. C. on January 14, 1974, the general work and travel schedule was reviewed and agreed upon. The schedule of events as they occurred is shown in Appendix II.

The symposium was held in San Francisco on January 15-18. The technical session and their content is shown in Appendix III.

During the period of the symposium frequent meetings were held between the Soviet delegation and members of the Particulate Control Committee of the U.S. Working Group for Stationary Source Air Pollution

Control Technology.


The meetings resulted in identification of the subjects of greatest interest from the standpoint of future collaboration. These subjects are identified in a statement of recommendations to the Working Group for their consideration in development of future agreements for cooperative research. This statement is included in Appendix IV.

Both sides agreed that the symposium was successful in its purpose. The presentations by speakers from both countries were of the highest quality and were most useful in defining the positions of both the U.S. and the U.S.S.R. in development of capability for improved control of particulate air pollution. Many common problems and numerous areas of common interest in research and development were identified. It was agreed that both sides have developed understanding of the other's programs so that it should now be possible to develop detailed plans for cooperative projects at a future meeting of experts on the subjects listed in the recommendations of Appendix IV.

It was further agreed that proceedings for the meeting would be published as soon as possible. The goal will be to complete this work prior to the next meeting of the working group in March 1974 so that it can be used as an information source for any consideration they may give the present groups recommendations.

The Protocol was signed on January 21, 1974 in Washington, D.C.
in English and Russian; both languages equally authentic.

For the U. S. Delegation



MR. PAUL W. SPAITE
Head of the U.S.A. Delegation
in the Working Group, Private
Consultant

For the U.S.S.R. Delegation



DR. G. K. LEBEDYUK
Head of the U.S.S.R. Delegation
in the Working Group, Deputy
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APPENDIX I

PARTICIPANTS

SYMPOSIUM ON CONTROL OF FINE PARTICULATE
EMISSIONS FROM INDUSTRIAL SOURCES

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APPENDIX II

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U.S.-U.S.S.R. WORKING GROUP

STATIONARY SOURCE AIR POLLUTION CONTROL TECHNOLOGY

Symposium on Control of Fine-Particulate
Emissions from Industrial Sources

January 13-23, 1974

Day 1 - Sunday, January 13

6:30 p.m. U.S.S.R. delegation arrives at Kennedy Airport, N.Y.
Meet EPA representatives and translator at the Airport.

Day 2 - Monday, January 14

9:00 a.m. Visit Soviet Embassy
10:30 a.m. Visit Environmental Protection Agency
8:00 p.m. Arrive at Holiday Inn, San Francisco

Day 3 - Tuesday, January 15

9:00 a.m. Symposium begins (Session 1, Opening Addresses), Pacific North Room
1:30 p.m. Session 2, Conventional Technology, Electrostatic Precipitators
6:30 p.m. Reception for Symposium participants

Day 4 - Wednesday, January 16

8:30 a.m. Symposium reconvenes (Session 3, Conventional Technology, Wet Scrubbers)
1:30 p.m. Session 4, Conventional Technology, Fabric Filters

Day 5 - Thursday, January 17

8:30 a.m. Symposium reconvenes (Session 5, Advances in Applications)
1:30 p.m. Symposium reconvenes (Session 6, New Concepts)

Day 6 - Friday, January 18

8:30 a.m. Symposium reconvenes (Session 7, Advances in Measurement Techniques)
1:00 p.m. Symposium ends
1:30 p.m. Plant Tour- Combustion Power Corporation, Menlo Park California.
A tour of the Solid Waste Power Generation pilot plant, conducted
by Mr. Sam Eveleth, Combustion Power Corporation and Mr. Dick Chapman,
EPA Project Officer.

Day 7 - Saturday, January 19

9:00 a.m. Working Group planning session

Day 8 - Sunday, January 20

12:30 p.m. Plant Tour - Southern California Edison Power Plant, Los Alamitos, California. A tour of the bay house filter, conducted by Mr. Jim Schoonmaker, Plant Engineer

Day 9 - Monday, January 21

12:00 a.m. Visit EPA, for final discussions and preparation and signing of agreement

6:00 p.m. Farewell dinner at Washington-Hilton Hotel

Day 10 - Tuesday, January 22

10:00 a.m. Leave Washington National Airport for New York

Day 11 - Wednesday, January 23

8:00 a.m. Leave New York City for Boundbrook, New Jersey

10:00 a.m. Plant Tour - Research Cottrell, Boundbrook, New Jersey, A discussion and tour of the facilities, conducted by Mr. Dave Klipestein of Research Cottrell.

12:00 p.m. Leave Boundbrook for N.Y. City and Kennedy Airport

8:30 p.m. Leave New York City on Aeroflot Airlines

SYMPOSIUM ON CONTROL OF FINE PARTICULATE
EMISSIONS FROM INDUSTRIAL SOURCES

Tuesday, January 15, A.M.

Opening remarks - P. W. Spaite, Symposium Chairman
Welcoming address - R. E. Harrington (EPA)
Overview of the problem, USSR - G. K. Lebyedyuk (USSR - NIIOGAZ)
Keynote address - S. M. Greenfield (EPA)
Overview of the problem, USA - A. B. Craig (EPA)

Tuesday, P.M.

Conventional Technology, Electrostatic Precipitators:

Chairman: Sabert Oglesby (Southern Research Institute)

Major fields of application, technology, and
problem areas - J. J. White

Theoretical basis for design of modern high-efficiency
electrostatic precipitators - I. K. Reshidov
(co-authors V. I. Levitov, V. M. Tkachenko) (NIIOGAZ, USSR)

Theoretical and practical aspects of fine particle collection
by electrostatic precipitators - G. B. Nichols (Southern
Research Institute)

Removal of particulates from smoke stack gases in power
stations with electrostatic precipitators - I. K. Reshidov
(co authors I. A. Kisim, V. M. Tkachenko) (USSR - NIIOGAZ)

Design features of modern smoke stack electrostatic
precipitators - I. K. Reshidov (co-authors M. A. Alperovich)
(USSR - NIIOGAZ)

Operating experience with SO₂ gas conditioning - W. S. Landers
(Public Service Co. of Colorado)

Wednesday, January 16, A. M.

Conventional Technology, Wet Scrubbers

Chairman: C. E. Lapple (Stanford Research Institute)

Scrubber performance for fine particle collection -
Seymour Calvert (A.P.T., Inc.)

High velocity synthetic fiber mist eliminators - G. K. Lebyedyuk
(co-authors B. I. Myagkov, I. G. Kamenshchikov, V. V. Malinov)
(USSR - NIIOGAZ)

Effects of water vapor condensation on particulate
collection by scrubbers - L. E. Sparks

Wet gas cleaning in iron and steel industry - G. K. Lebyedyuk
(co-authors A. Yu. Valdborg, F. E. Dubinskaya) (USSR - NIIOGAZ)

Use of Venturi scrubbers for removal of highly dispersive
particulates - G. K. Lebyedyuk (USSR - NIIOGAZ)

Use of scrubbers for control of particulate emissions from
power boilers - I. A. Raben (Combustion Equipment Associates, Inc.)

Wednesday, P.M.

Conventional Technology, Fabric Filters
Chairman: George Rogers

Major applications and associated problems - C. E. Billings

Instrumentation for dispersion analysis of particulates
under industrial conditions - V. P. Kurkin (USSR - NIIOGAZ)

Bases of gas filtration theory through porous media -
V. P. Kurkin (USSR - NIIOGAZ)

Factors in collection of fine particulate matter with
fabric filters - Richard Dennis (GCA/Technology Div., GCA Corp.)

High temperature filtration technology - D. C. Draemel
(University of California)

Thursday, January 17, A.M.

Advances in Applications:

Chairman: H. L. Falkenberry (Tennessee Valley Authority)

Atomization and cloud behavior in wet scrubbers - H. E. Hesketh
(University of Southern Illinois)

Soot removal from industrial gases - V. P. Kurkin (USSR - NIIOGAZ)

Application of wet electrostatic precipitators for control
of fine particulate matter - Even Bakke (MikroPul Div., U.S. Filter Corp.)

Volume conduction in fly ash - R. F. Bickelhaupt (Southern Res. Institute)

Thursday, P.M.

New Concepts:

Chairman: J. K. Burchard (EPA)

Fundamental aspects of fine particle control: prospects for improved technology - J. R. Brock (University of Texas)

Systems of charged particles and electric fields for removing submicron particles - J. R. Melcher (Massachusetts Institute of Technology)

Advances in the sonic agglomeration of industrial aerosol emissions - D. S. Scott (University of Toronto)

Friday, January 18, A.M.

Advances in Measurement Techniques:

Chairman: Elbert Tabor (EPA)

Particulate mass measurement - J. A. Dorsey (EPA)

Plume opacity measurement - D. S. Ensor (Meteorology Research, Inc.)

Technology of particulate sampling from reactive, high-humidity content, and high-temperature gases - (presented by V. P. Kurkin, abstract read in English by Mr. Tabor) authors: V. A. Anikeyev, V. P. Bugayev, V.A. Limanskiy, E. N. Andrusenko, V. Yu. Padva. (USSR - NIIOGAZ)

Chemical composition of fly ash - D. F. S. Natusch (University of Illinois)

Theoretical principles of unstationary filtering - V. P. Kurkin (USSR - NIIOGAZ)

Measurement of particle size distributions at emission sources with cascade impactors - M. Y. Pilot (University of Washington)

Concluding Remarks & Summaries

APPENDIX IV

A List of Scientific and Technical Projects in the Field of
Stationary Source Control of Mutual Interest in Both Countries

Discussions in the United States during the period January 13-23 between representatives of the US-USSR resulted in identification of numerous subjects of common interest in the fields of development relating to particulate air pollution control.

Some of these subjects are considered by both sides to be of sufficient interest in both countries to warrant immediate consideration for cooperative research. For these subjects, it is felt that meetings between experts from both sides be scheduled for detailed consideration of plans for collaboration. It is anticipated that such meetings would involve complete assessment of data from past research and formulation of plans for joint research. Such plans would identify specific facilities, programs and personnel which would participate in the cooperative work.

Also it would identify specific work to be undertaken by both sides and make provisions for exchange of information. Specific subjects deemed appropriate for such meetings are listed below.

- A-1. Studies of the effectiveness of industrial control equipment in collection of fine particulate.
- A-2. Studies of the means to enhance e.s.p. performance.
- A-3. Studies of the application of devices for the measurement of particulate physical and chemical properties.

A-4. Studies to develop industrial applications of coordination scrubbers.

A-5. Research in the use of fiber mist elimination devices for three-phase systems.

A-1. Studies of the effectiveness of industrial control equipment in collection of fine particulates.

Studies of the effectiveness of high-efficiency industrial control equipment in collection of fine particulates would be carried out using common methods to evaluate fine particulate emissions. Systems to be evaluated would include those identified to be of interest to both sides, e.g. electrostatic precipitators on a coal burning power plant, a granular bed filter on a steel plant, or fabric filters for collection of fly ash. The objective would be to show the effectiveness of systems selected to demonstrate the best practice in important industries or to show the usefulness of existing equipment in new uses.

A-2. Methods of enhancing precipitator performance in collection of high resistivity dusts.

Cooperation in this area could take the form of information exchange as well as cooperative research programs. Areas that should be included would be 1) Standardization of instrumentation for measuring dust resistivity. 2) Investigation of the relationship between resistivity and fuel and ash properties. 3) Precipitator modification to reduce detrimental effects of back corona. 4) Experience in use of chemical conditioning agents to modify ash resistivity. 5) Experience with variation in flue gas temperature

to alter dust resistivity.

A-3. Studies of the application of devices for the measurement of particulate physical & chemical properties.

Investigations of the problems associated with measuring the concentration and composition of particulate in control device studies are required. These should include such items as the effects of reactive gases, high moisture content, and rapidly changing conditions on the accuracy of the measurements. Comparative tests of concentration, size distribution and analytical measurements used in the U.S. and U.S.S.R. are needed to permit investigators to interpret the data exchanged on other joint projects. A direct comparison of the impactors and cyclone sizing devices developed and used in each country is especially critical for the fine particulate programs. The possibilities for temporary equipment exchanged for this purpose should be considered. These studies should initially be conducted in actual industrial gas streams.

A-4. Studies to develop industrial applications of condensation scrubbing.

Condensation scrubbing is taken to include methods and devices which apply condensation of vapors to affect or enhance the removal of fine particulate. Studies of this type of control device are of great interest to both sides. Projects to develop such systems are underway in both the U.S. and the U.S.S.R. There is a need to develop research data and do the engineering analyses necessary to determine where and how extensively such systems could be applied to control emissions of particulate from industrial processes. Cooperation in this work could speed the rate of development.

A-5. Research in the use of fiber mist elimination devices for three-phase systems.

Research in the use of fiber mist elimination devices for three-phase systems is of great interest on both sides. The kind of work which is needed would be conducted on bench or pilot scale equipment. It is anticipated that needle punched felts and other fibrous materials could be prepared to prescribed specifications in the U.S. The materials could be tested using facilities in the U.S.S.R. The test results would be shared by both sides.

Other subjects of common interest were identified but possibilities for present cooperation could not be evaluated in detail from information available to the parties present. Still others appear to be appropriate subjects for further information exchange rather than subjects which seem appropriate for jointly planned research or testing.

- B-1. Investigation of electrostatic precipitator reliability and maintenance.
- B-2. Fundamental studies of electrostatic precipitator technology.
- B-3. Studies of effect of chemical and physical properties of particulate on scrubber performance.
- B-4. Development of improved methodology for design of electrostatic precipitators.
- B-5. Calculations to predict performance of air pollution control devices.

- B-6. Studies of the applicability of fabric filters to control of industrial dusts.
- B-7. Studies to compare air pollution control practices in important industries of the U.S. and the U.S.S.R.
- B-8. Investigation of automatic techniques for measurement of mass emissions and size distribution of particulate.
- B-9. Development of new fine particulate control devices.

B-1 Reliability & Maintenance Problems

This area of cooperation might include a cataloging of the particular maintenance problems with precipitators in both countries and investigations into methods of improving reliability, such as studies of causes of electrode failure and means for reducing their frequency. Experience with rapping equipment and ash removal equipment would be fruitful areas of cooperation.

B-2 Precipitator fundamentals

Work is underway in the U.S. and U.S.S.R. to mathematically define the electric field in precipitators and the influence of space charge due to particulates. Also, mathematical prediction of particle charge for dusts of various sizes and experimental verification of the charge would be fruitful areas of cooperation. Work on dynamics of particle collection would be of interest.

B-3. Studies of the effect of chemical and physical properties of particulate on scrubber performance.

The chemical and physical properties of particulates and the gas stream are known to effect the efficiency of their collection by control devices. data on the nature of these effects and their relative importance exists. Better information on the importance of such factors is of interest to both sides. It is therefore proposed to exchange information and explore the potential for joint research projects in this area.

B-4. Design Methodology

Cooperation in this area might include a review of the methods for establishing precipitator parameters, such as gas velocity, plate area and rapping intensity. Work with pilot precipitators and scale up factors to full sized units would be mutually beneficial. Also, work in both countries in the area of establishing quantitative engineering methods for precipitator sizing would be a fruitful area for cooperation.

B-5. Calculations to predict performance of air pollution control devices.

Emperical or theoretical equations that incorporate the principal variables of particulate control devices (scrubbers, filters, electrostatic precipitators) in operation, and effectively predict performance are needed. The purpose of this project would be to exchange available information and data on such equations and on research results aimed at developing and verifying such equations. The opportunity would be explored for conducting joint research leading to the development and verification of such equations.

B-6. Studies of the applicability of fabric filters to control of industrial dusts.

Studies of the broad applicability of fabric filters to control industrial particulate emissions are of interest to both sides. A mobile pilot scale fabric filter unit is being fabricated in the U.S. to test the ability to control a variety of industrial processes emitting particulates. A similar program has been underway in the U.S.S.R. for some time. It is felt that information should be exchanged and consideration given to continuing cooperation in exchange of data.

B-7. Studies to compare air pollution control practices in important industries of the U.S. and U.S.S.R.

Specific industries would be selected as being of interest to both the U.S. and U.S.S.R., for comparison of particulate control practices and their effectiveness. Primary attention would be given to the control of fine particulates. For instance, industries of particular interest could include:

- Electric aluminum plants
- Secondary non-ferrous smelting

B-8. Investigations of automatic techniques for the measurement of mass concentration and size distribution.

An exchange of more detailed information on automatic techniques should be initiated so that the applicability of analysis principles to specific industrial processes can be determined. Both instruments suitable for engineering studies and these suitable for continuous process monitoring should be considered. Programs to evaluate instruments on specific process streams need to be undertaken at the earliest possible

time so that the present lack of capability in this area can be overcome.

B-9. Development of new fine particulate control devices

New approaches which go beyond the principles of operation of conventional equipment (electrostatic precipitators, scrubbers and fabric filters) are considered by both sides to have potential for fine particulate control. Research and development of such systems is being conducted both in the USA and USSR. This work considers such approaches as charged particle/droplet scrubbing, sonic agglomeration and foam scrubbing. It is the purpose of this cooperative project to (1) identify, exchange information, and explore joint research on ongoing programs involving new approaches and (2) provide a mechanism whereby each side will keep the other apprised of new developments in this field. Charged particle/droplet scrubbing was identified as one approach of particular interest to be explored at the earliest opportunity.